THE BRICK

For Rear Wheel Drive Volvos 1975-1997

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IN THIS ISSUE:

Converting a Volvo to Electric pg1

Cameron's Turbo build update pg 2

Tune-up pg 4

Air Mass Meter Tech Tip pg 10

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The E-Volvo: Converting my Volvo to Electric Power

By: Mike Ahern - ipd Customer

My name is Mike Ahern. I am a process engineer for a company called Solyndra, which makes solar panels in Fremont, Ca. I wanted to get to work without using gasoline. I live in West San Jose, about 16 miles from work.

100 lbs of parts, not counting the engine, were removed from the car.

I started reading about electric cars and pretty quickly found people doing it themselves. It looked like fun and I thought I could do it. I found a company, EV America, which sold me most of the parts and helped me with a video, a manual and assisted with my many phone calls.

There were many people who told me I ought to use a lighter car, but I love Volvos and their safety. I will never drive another brand of car. I decided the added weight of the Volvo was a challenge. When considering adding 1000 lbs of batteries to a car, the structural integrity of Volvos make them great candidates for electric conversion. I have owned 5 Volvos and bought parts for all of them at ipd over the years. I decided the platform for my conversion should be a 240.

First, I purchased a donor car. I found a 1978 Volvo with a blown engine on craigslist for $150. It had a manual transmission and manual steering. I would have preferred manual brakes but all 240s had power brakes. In retrospect, 4 wheel disc brakes and power brakes are good for stopping a car that ended up 500 lbs heavier than stock after the electric conversion.

If you get a car with manual steering you don't have to worry about what will spin the power steering pump. Every conversion I have seen requires a manual transmission. The coupler and adaptor plate I got used the existing manual transmission. I sent the clutch plate to a machine shop and they mounted the coupler right to it. I got a 12 V electric vacuum pump on ebay which supplies vacuum for the brake booster. My brake booster turned out to be leaky so I got another one from the Pick n Pull in San Jose. The replacement booster works great.

After towing the car home, I started removing things from the donor car, first the radiator, then the exhaust, then the engine. The first new thing put into the car was the 9 inch dc electric motor, from Advanced Electric DC motors. The original manual transmission was mated to the DC motor with an adaptor plate from EV America. The clutch was removed, the shifting of the car is now done without a

Continued on page 3

Annual ipd Garage Sale

May 16, 2009 is when the 26th Annual ipd Garage Sale, Swap Meet and Car Show will take place. We look forward to this event each year and we're excited to have games, prizes, giveaways, sale pricing on most of our stock and much more. Doors will open to the ipd sales desk from 9:00am until 1:00pm and the swap meet and car show has been extended to run until 3:00pm. We hope to see you here for this great event.

Garage Sale is 9:00am to 3:00pm Saturday May 16th.
For more information on displaying your Volvo or to reserve a swap meet spot call 800-444-6473
or e-mail our show coordinator Bud Cowgill at rcowgill@ipdusa.com

Update on Cameron's 16V Turbo Wagon Project

By: Cameron Daline

A good deal has changed since the last project update. I have received several packages in the mail lately, including one from SHS Performance (www.shsperformance.no) containing the amazing lightweight adjustable cam gears, high flow billet aluminum fuel rail, billet water pump pulley and light weight aluminum auxiliary shaft pulley all in matching anodized blue! Efficiency and adjustability is the name of the game here, with lighter weight rotating components which will free up that much more tire-smoking power for the engine, and adjustability in the cams to eek out every last nano-horsepower available. The fuel rail should open up the bottle neck previously inline with the fuel system, and make sure that I don't run out of the good juice!

I also received the billet aluminum 16v timing belt tensioner adapter plate from ipd customer Robert Foltz. This piece allows me to use the stock b230-style timing belt tensioner, but locates it and the auxiliary roller bearing in the proper place and allows the use of an 850 timing belt. The beautiful UPS man brought my lightened and balanced (down to ~21 pounds!) flywheel to the door from Knox motorsports (www.knoxmotorsports.us), along with a match-balanced SPEC Clutch stage III pressure plate and custom built clutch disk. The disk uses a BMW center section to mate up to the splines on the BMW Getrag transmission, and a Volvo sized 6-puck racing disk utilizing a high performance carbon/copper/ceramic friction material.

Finally, I picked up the killer stainless steel header from Jonathan over at RSI. It utilizes equal-length runners for optimum cylinder evacuation, and pulse paired technology which helps to even out the pulses from the cylinder head. All this plumbed into a twin scroll t-3 turbo flange which when mated to the GT32 turbo I just ordered should significantly increase the rate of boost spool up and overall flow.

There are still several details to take care of on this project, as well as some custom fabrication, test fitting and final assembly. For example, I still need to spec a proper shifter for the Getrag transmission and modify the driveshaft to properly mate up to the rear of the Getrag output shaft. The transmission cross member needs to have some brackets welded onto it to fit a transmission mount and properly set the angle of the drivetrain. And then there is the wiring and tuning of the engine management system (gulp!).

Nuke performance parts from SHS Performance.

Fitting the new stainless header from RSI.

Lightened and blanced LH2.4 flywheel.

Continued from page 1

clutch. It is not a difficult process once you get the hang of it. Mostly I just use 2nd and 3rd gears.

The mount on the motor came from EV America, it was made for an S10 pickup. I had a sheetmetal company in Santa Clara, CA called Pega Precision make me the 1/4 plate steel mounts which got me from the mount on the motor to the mount on the car. ipd sold me new rubber motor mounts. So from the frame of of the car it goes: Volvo metal mount, Volvo rubber mount, Volvo metal mount, fabricated mount, S10 electric motor mount, motor.

Also from ipd I got the sway bar kit for front and back sway bars, the beefier rear springs, and new rear shocks.

There is a variable resistor box with a place to attach the throttle cable, I mounted that on the drivers side in the engine bay. The Curtis controller I mounted to the adaptor plate near the firewall. EV America sent a detailed schematic, which made it easy to wire everything up.

On the right of the picture below is the resistor box. This box sends a variable dc voltage to the Curtis Controller, which sends pulse width modulated (pwm) voltage, 144V, to the motor, the duty cycle dependent on how far down I am pressing the accelerator.

With electric cars, there is a lot of current going through the wires, sometimes over 100 amps. So you need big wires. A neighbor had 1/0 copper welding cable he gave me and I used it for most of the cables. The lugs for the cables came from Grainger, and from work I borrowed an electric crimper which made great hex crimps.

For the battery boxes I used aluminum bar stock I got from work, and a lot of trips to Orchard Supply Hardware for hardware and various fasteners. There are four batteries in the engine bay and eight batteries in the trunk. The 12 Trojan T1275 lead acid batteries are wired in series, and there are 2 long cables going under the car from the front to the trunk. I mounted the long cables using the exhaust hangers.

The 144 V charger I bought from Electro Automotive. It plugs into a standard 110 VAC outlet, and turns itself off when the 12 batteries are fully charged. I drive around with 2 long extension cords, enabling me to get power from about 100 feet from the car. Once I got a charge from a plug in by a soda machine at a minimall.

There is an accessory battery, which I got from the local pick n pull. It runs the lights, wipers, brake vacuum pump and the control voltage for the contactors and fans for the electrical components. I charge it separately with a 12 V charger. When I need warmth I use a hat.

To legalize it I had to go to the Cal DMV. First they sent me to the smog referee. Once the smog people had verified that it was all electric, I went back to the DMV and got it legalized. If I go back one more time, I can get a carpool lane sticker for the evolvo.

The engine compartment reveals the modifcations made: Curtis controller, charger, batteries, and resistor box.

My daily driver is still a 1990 240 wagon, but as the weather gets warmer and the daylight gets longer I plan to drive the evolvo to work more until hopefully soon it is the daily driver. Supposedly if I am careful with the battery pack it will be good for 20,000 miles. In 2 years ideally the prices on lighter more exotic batteries like lithium ion will come down.

Results:

- Range: 35 miles between charges.
- 6 hours to completely charge 12 12V batteries
- Total cost to charge $1.32
- Top speed 55 mph.
- Total time from getting donor car until running all electric: 14 months
- Total cost for conversion: $8000

Major tools needed:

- Engine hoist (for removing old engine, installing new motor, installing batteries, 82 lbs each)
- Band saw
- Drill press
- Hand drill
- Voltmeter
- Crimper tool for battery cables

Sources:

- http://www.ev-america.com/
- http://www.electroauto.com/
- Silicon Valley Electric Auto Association: http://www.eaasv.org/

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IK114X Reviewed by David Guido from Saratoga, CA

I decided to get this kit when my 1988 245 had 120K miles and used every part.

All high quality at bargan prices. I'm now about ready to get another one now that I have over 200K miles.

Tune up Time? Do it Right!

The first step to a well-balanced relationship between car and driver is a tune-up kit from ipd. Utilizing original equipment Bosch components where applicable for the best in quality and value, our tune-up kits offer the ideal platform for efficient performance. For those considering a complete service makeover, our 60,000-mile extended service kits offer the necessary components for a complete service of the engine and drivetrain on your Volvo. All of the parts in our kits are OEM quality for the best in performance and fitment. For more information on ipd tune-up kits, their applications, or additional maintenance advice, give us a call.

Bosch Tune-up Kits

Includes distributor cap, rotor and spark plugs.

240 series	B21F	1976-83	**MLIK108**	$17.92
240 series	B230F	1985-93	**MLIK114**	$18.14
240 series (white cap)	B21MPG, B23F	1981-84	**MLIK115**	$22.50
240 series turbo, GLT	B21FT, B23E	1981-85	**MLIK119**	$17.84
240 series	B23F	1983-84	**MLIK116**	$21.49
740, 940 series	B230F (cam driven)	1985-95	**MLIK117**	$65.25
700, 900 series	B230FT (cam driven)	1985-95	**MLIK118**	$65.17
700 series	B23FT	1984	**MLIK120**	$20.91

Bosch Extended Service Kits (60,000 mile service)

Includes rotor, cap, spark plugs, air filter, fuel filter, oil filter, ignition wire kit, timing belt, flame trap, differential gasket, oil drain plug, injector seals, and fuel filter seals on models where needed.

240 series	B21	1981-82	**MLIK108X**	$103.80
240 series	B230	1985-92	**MLIK114X***	$105.47
240 series	B21FT	1981-85	**MLIK119X**	$109.69
240 series	B23F, B230	1983-84	**MLIK116X**	$108.31
700, 940 series	B230	1985-92	**MLIK117X** (cam drvn dist)	$138.36
700, 940 series	B230FT	1985-92	**MLIK118X** (cam drvn dist)	$140.45
700, 940 series	B230	1993-95	**MLIK217X** (cam drvn dist)	$150.19

***NOTE: Two distributor shaft sizes were used on 1985 240 non turbo models. you'll have to measure the shaft OD or the rotor ID to ensure you get the correct rotor.**

***If you measure 3/8" / .400" use tune up kit number MLIK114(X) (rotor #04170). For 9/16" / .565 use kit number MLIK116(X) (rotor # 04138).**

****Rex-Regina cars will require a different coil wire (#ML6842734).**

Bosch Style Coil

Rex Style Coil

Cam Driven Distributor

Side Driven Distributor

Spark Plug Wires by ipd

Our custom spark plug wires are made with a high quality 8mm silicone jacket and feature a spiral wound core for maximum electrical efficiency. Each wire set is custom designed for each application covering over 40 years of Volvo models. Engineered to meet and surpass OEM quality, our wire sets include factory style metal end connectors (where applicable). Each wire set includes spark plug and coil wires as well as dielectric grease used on the plug boots for easy removal at tune-up time.

240 series	1976-93	spark plug wires by ipd	**ML3E240**	$69.95	***SALE $62.95***
700, 900 series	Bosch	spark plug wires by ipd - cam drvn	**ML3E7900B**	$69.95	***SALE $62.95***
700, 900 series	Regina	spark plug wires by ipd - cam drvn	**ML3E7900R**	$59.95	***SALE $53.95***

Original Equipment Spark Plug Wires by Bosch and Bougicord

A properly tuned ignition system is one of the most important factors of any engine. It will keep your engine running smoothly, economically and will deliver the most power. The increased heat under the hood may lead to premature degradation of the ignition wires. These wires are made by the original equipment supplier to Volvo so you are assured of the best quality in replacement wires.

Kit w/90° #1 wire for A/C. Complete kit with Bakelite ends - **Bosch**

240 series	1975	B20	**ML3E0909**	$30.30

Kit (2 coil wires - both short and long wires included) Metal jacketed ends - **Bougicord**

240 series	1976-93	B21, B21FT, B23, B230	**ML3E0921**	$55.11

Complete kit (cam driven distributor) Rubber ends - **Bougicord**

700, 940* series	1985-95	B230, B230FT	**ML3E0925**	$40.90

(REX-1) for coil mounted on driver's side Rubber ends - **Bougicord**

700, 940* series	1989-95	B230	**ML3E0926**	$37.17

Spark Plug Thread Repair Kit

If you have a 1976-1995 4-cylinder Volvo with marginal or damaged spark plug hole threads, you can now make a quick, professional repair in minutes without removing the cylinder head. Kit includes everything needed to permanently repair 2 spark plug holes. Works on all B21, B23 and B230 engines. Remember that you can reduce the chances of this happening by using a small amount of anti-seize compound on the spark plug threads every time the plugs are replaced. Kit contains 1 specialized reamer tap, 2 thread inserts and locking compound.

1976-95 Volvo 4 cyl	**MLT3414**	$39.00
2-pack of extra thread inserts	**ML34142**	$5.34

NGK and Bosch Spark Plugs

The first suspect in a poor-performing engine always seems to be the plugs.

On overhead cam engines one should expect about 30k miles but, as these are getting older, they are wearing out sooner too. Contaminants such as oil and incorrect fuel mix will shorten the life of a plug dramatically.

We have been using and selling NGK spark plugs since the seventies because they're the leaders in copper core technology. Copper is a great conductor of electricity and heat, so copper spark plugs perform well under all extremes and have a large conductor tip for maximum spark area.

4 cylinder non-turbo	1976-93	**MLBP6ES**	NGK spark plug	$1.95 ea
4 cylinder non-turbo	1976-93	**MLBPR6ES**	NGK resistor spark plug	$1.95 ea
turbo 4 cylinder all	1981-93	**MLBP7ES**	NGK spark plug	$1.95 ea
turbo 4 cylinder all	1981-93	**MLBPR7ES**	NGK resistor spark plug	$1.95 ea
960 series, S90	1993-98	**MLFR7DC**	Bosch resistor spark plug	$1.95 ea

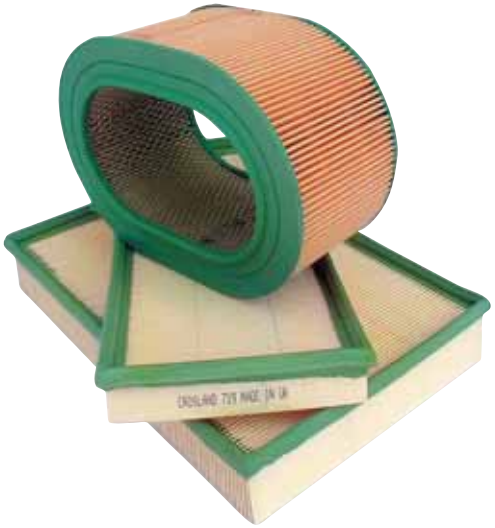
K&N Air Filters

This filter has an international reputation for effective service under the most grueling conditions. Patented design utilizes surgical cotton in multi-layers, oiled and sandwiched between wire mesh. K&N filters not only clean the air, but also straighten the air flow. Your engine is provided with a less turbulent air stream than other popular filtering mediums (like paper and foam.) Under normal conditions cleaning and reoiling is not required until 50,000 miles (without loss of efficiency!) K&N filters come pre-oiled and ready for installation.

240 series non-turbo, 1976-93	**ML2C2538**	$54.22	***SALE $48.80***
240 series turbo, 1981-85	**ML2C9032**	$78.40	***SALE $70.56***
700, 940 series non-turbo	**ML332526**	$55.56	***SALE $50.00***
700, 940 series turbo	**ML2C2043**	$82.02	***SALE $73.87***
960, 90 series	**ML332755**	$59.94	***SALE $53.95***
Filter care kit (oil and cleaner)	**ML2C9950**	$13.52	***SALE $12.17***

Stock Replacement Air Filters

While there is no replacement for the K&N filters listed above, there is a substitute. Try one of our quality paper elements, just like the one that your Volvo came with. Easy to install and maintain — just discard and replace with a new one when needed. Check air filter every 10,000 miles. Replace it every 30,000 miles or more often in dirty or dusty conditions.



Original Paper Style Air Filters

240 series	B20F	1975	(K Jet.)	**ML460886**	$25.00
240 series	B21F, B23F, B230F	1976-93	rectangular (K & LH Jet)	**ML463505E**	$8.44
240 series	B21F, B23F, B230F	1976-93	rectangular (K & LH Jet)	**ML463505M**	$8.80
240 series turbo	B21FT	1981-85	oval	**ML1276825**	$15.74
700, 940 series	B230F, B234F, B280	1985-95	rectangular 11.25" x 8.25"	**ML1336397**	$8.44
700, 900 series turbo	B23FT, B230FT, D24T	1983-95	rectangular 13.25" x 9.5"	**ML1257546**	$12.00
200,700 series	B21,B23,B230	1982-89	housing thermostat	**ML1266826**	$12.44
960, 90 series		1992-98	air filter	**ML1336397E**	$8.44
960, 90 series		1992-98	air filter	**ML1336397M**	$11.50

Part #'s ending with an "E" denotes that this is an economy version of this part. Part #'s ending with an "M" denotes Mahn or Mahle brands.

Mann® Oil Filters

To our knowledge, this is simply the best filter you can buy for the money. This filter manufactured by Mann® grabbed the number one slot in an oil filter test by the Volvo Club of America. Mann is the original supplier of oil filters to Volvo. Fits all 1962-98 Volvos except for diesels or V6.

1975-98, All models	Mann oil filter	**ML3517857**	$4.95 ea
Case of 10	Mann oil filter	**ML3517**	$39.50 case
4 cylinder all	copper oil pan drain plug seal ring	**ML18818***	$0.50 ea
960, 90 series	aluminum oil pan drain plug seal ring	**ML977751***	$0.45 ea

Not for V-6 or diesel

Oil Soak Mat

This patented, leak resistant mat looks like a black rug, yet it has the ability to absorb and retain hundreds of hazardous and non-hazardous liquids such as oil, gasoline, diesel fuel, hydraulic fluid, transmission fluid, anti-freeze, water, and more.

Absorbs up to one gallon of liquid. The leak resistant back will not allow the absorbed liquids to soak through to the floor underneath. Under normal use this mat can't be ripped, yet it can be custom cut with an ordinary pair of scissors or utility knife. Plus, this mat can be recycled. The oil soak mat measures 3 ft. x 5 ft.

Oil soak mat	**MLR2**	$19.90	***SALE $17.91***

Oil Filter Grabbers

This tool works great for most Volvo engine compartments. It's especially nice for the Turbo engine where access is very tight. With slotted adjustment for large and small oil filters and a 20° off-set, you can get at those filters with limited access and still have a good grip and the leverage needed to spin them off. Not for plastic cartridge style filters.

Oil filter grabbers	**MLT1011**	$19.95	***SALE $17.95***

Magnetic Oil Drain Plug

Prevent abrasive particles from recirculating through your oil pump and back into the pressurized system with our magnetic drain plug. This plug catches and holds metal particles as they drain into the oil pan.You'll be able to spot deteriorating engine conditions easily. Plug includes a seal ring.

4 cylinder all	drain plug w/seal	**ML2A9550***	$4.95	***SALE $4.45***
960, 90 series	drain plug w/seal	**ML2A9851**	$7.95	***SALE $7.15***
4 cylinder all	additional copper seal ring	**ML18818***	$0.50	***SALE $.45***
960, 90 series	additional aluminum seal ring	**ML977751***	$0.45	***SALE $.45***

Not for V6 or diesel.

Oil Filter Magnet

Capture every microspeck of metal that causes engine wear. Debris that your oil filter alone might not be able to screen.

Made of a strong, flexible silicone this oil resistant magnet withstands temperatures up to 500°F. Simply attach it to the outside of your oil filter and let it do the work.

The super strong rare earth magnet begins working immediately to power clean your oil. Your oil and your engine will continue to get cleaner month after month through normal driving and proper maintenance. The permanent rare earth magnet will never wear out, so you'll enjoy a lifetime of protection that goes far beyond conventional mechanical filtration.

Oil filter magnet	**ML2000A**	$12.00	***SALE $10.80***

Pre Pump

By Eric Mollerstuen

Symptoms: Low pitched growling sounds, especially in hot weather and when fuel level is low. The car also may feel underpowered or even hesitate or misfire. The sound will come from the main fuel pump located under the car, just in front of the driver's side rear tire.

Troubleshooting: Try removing the fuse that provides power to it (usually fuse #5). If the pre-pump is functioning, the idle should drop about 2-300 rpm when power is cut to the pump. If the idle doesn't change, the pre-pump has probably failed. You can also remove the gas cap and listen in the tank when the car is running for a slight humming sound. Sometimes the pre-pump hose inside the tank will crack or fall apart and this will show up as a poor running condition when the tank nears empty. The best way to test the function of the pump is to remove the fuel line between the tank pump and the main pump, at the inlet of the main fuel pump. Put the end of the fuel line in a bucket or container and turn the key on. If the pump is working, it will start flowing fuel into the bucket. If nothing comes out, the pre-pump is dead.

Main Fuel Pumps

A fuel pump either works or it doesn't. Be sure to fault-check the wires and the relay before replacing it. A repair to the power source is far less expensive than a misdiagnosed fuel pump. These pumps are the same original Bosch pumps that will last as long as the original.

200 series	All	1975-77	**ML1228599**	rubber mount (isolator) for main pump (2 used)	$1.72 ea
200, 700, 900 series	All	1978-95	**ML1346175**	rubber mount for fuel pump tray (3 used)	$3.03 ea
240, 260 series	B21F, B27F, B28F	1980-83	**ML61949**	main pump, K Jetronic	$164.72 ea
240 series	B21FT	1981-85	**ML61949**	main pump, K Jet. w/ turbo	$164.72 ea
240 series	B21F, B23F, B230F	1982-93	**ML61468**	main pump, LH Jetronic non-turbo	$164.31 ea
700, 900 series non-turbo	B23F, B230F	1985-97	**ML61468**	main pump LH non-turbo	$164.31 ea
700, 900 series turbo	B230FT	1985-97	**ML61425**	main pump LH with turbo	$154.39 ea
700, 900 series	B230 Regina	1989-91	**ML3507736**	in-tank main pump (ignition coil is square)	$149.95 ea

Prepump Upgrade for 240

Prepump failure is common in the early 240 series cars. They work well for the most part and, even when they fail and are replaced with a new one, they usually run like new. It's the K-jet cars (1978-84) that are most likely to benefit from a pre-pump upgrade. It seems that these 240s may have a main fuel pump noise and lack of full power even with a new original style in-tank prepump. In these cases, Volvo has a bulletin outlining the replacement of the original pre-pump with a later version that has a higher delivery capacity (#3517845 available in our kit).

Unfortunately, this is not a direct replacement pump. Modifications are required to the pick-up tube. The pick-up tube must be shortened by 30mm, because the pump is that much longer. And a clamp is required to secure the pump to the pick-up tube.

Prepump Upgrade for 240 Series (1978-85)

Prepump conversion kit includes: A, B, C, D, E, and instructions	**ML7845K**	$83.68

In-Tank Prepumps

If your Volvo runs but runs poorly (as if it is starving for fuel) a common problem area is the prepump (in-tank fuel pump). Another common symptom is that the car will run fine or a full tank, but below half-a-tank it stumbles and bucks, and the main pump will usually be quite noisy.

A. 200 series	B20, B21, B21FT, B23, B27	1978-83	**ML1276330**	$48.08 ea
A. 200 series	B23, B230	1984-93	**ML1389721**	$51.70 ea
A. 740, 760 series	All	1983-85	**ML1389721**	$51.70 ea
A. 700 series	All	1986-87	**ML3517845**	$73.20 ea
A. 700, 900 series	B230FT	1986-95	**ML3517845**	$73.20 ea
A. 940 series	B230F, B234F	1991-94	**ML1389721**	$51.70 ea
B. Filter	All models	1978-95	**ML1276565**	$9.03 ea
C. 200 series Fuel tank sender seal ring		1975-93	**ML949276**	$4.58 ea
D. In-tank prepump hose		1978-95	**MLH1016**	$0.50 ea
E. Prepump hose clamps		All	**ML21017**	$0.98 ea

Fuel Filters

How long has it been since the fuel filter on your Volvo was changed? If you're not sure, it would be a good idea to replace it at your next oil change or tune-up to prevent loss of performance or related problems. Under normal conditions, it's safe to replace the fuel filter at 30,000 miles or 2-year intervals. When changing the filter, it is very important to use safe handling procedures and be prepared for fuel spillage. Consult the appropriate workshop manual for specifics. To ensure a leak-free installation, always install new copper sealing washers (included with most of our filters). Also keep in mind that any foreign debris in the output side of the filter or fuel line could cause serious problems in the fuel system. It is very important to measure your fuel filter on 1975-80 240 series. It's the only way to be sure to get the correct one.

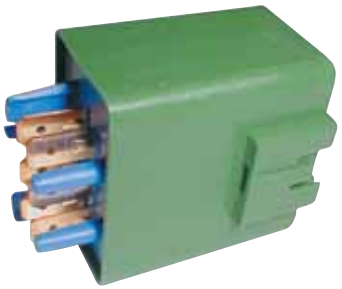
200 series	1975-80		K Jet. 2 1/8" x 4 1/8" long	**ML71020**	$10.08
200 series	1975-80		K Jet. 3 x 4" long	**ML71036**	$19.04
200, 700, 900 series	1981-97	All gas	K & LH Jet. 3 1/8" x 4 7/8" long	**ML71039**	$11.70
200, 700, 900 series	1977-95	All	in-tank prepump filter sock	**ML1276565**	$9.03

Fuel Tank Bung Nut Tool

Accessing the pre-pump and fuel gauge sender assembly on 240 and 260 models can be a tough job if you don't have the right tools. The difficulty lies in safely removing the large "bung nut" where all the lines and wiring go into the top of the tank. Believe it or not, that's the official name for that style of nut. It's a large ring with tabs that stick up at 60-degree intervals. The problem with using a drift or punch and a hammer is that the top of the fuel tank is only 4" below the floor of the car and the access opening is so small that you can't get much of an angle to properly engage the tabs. This causes the tabs to bend over, making it hard to reinstall. And if you ever need to open it again, it's so mutilated that it's even more difficult, if not impossible, to remove. Our bung nut tool has interlocking tabs that positively engage the bung nut tabs, allowing the bung nut to be removed with a 1/4 turn of a 3/8" ratchet. The right tool makes this job go much smoother and prevents the bung nut from being damaged. No cussing, no damage and, more important, no sparks from hammering steel on steel; hence, no unexpected, loud, violent explosions. Please note that any time the fuel tank sender assembly is opened, the rubber seal ring should be replaced for safety reasons.

240, 260 series	1978-93	fuel tank bung nut tool	**MLT5169**	$24.00	***SALE $21.60***

Fuel Pump Relays



A common failure causing a no-start situation is the fuel pump relay. The relay overheats over time, loosening solder joints internally and causing intermittent contact. It sometimes melts the circuit board. After you check for spark, consider the fuel pump relay as a possible problem area.

240, 260 series	B21, B21FT, B27 & B28	1978-85	fuel pump relay K-Jet only	**ML1348600** (1)	$61.43 ea
240 series	B21, B23	1982-84	fuel pump relay LH-jet (2 req.)	**ML1348657** (2)	$15.50 ea
240, 740, 940 series		1985-95	fuel pump relay	**ML3523608** (3)	$43.14 ea
760, 760 series turbo		1988-90	fuel pump relay	**ML1362914**	$42.00 ea
700, 900 series			auxiliary suppression relay	**ML1323592**	$22.80 ea
940 series turbo		1991	fuel pump relay	**ML1362914**	$42.00 ea
960 series		1992-93	fuel pump relay	**ML1362914**	$42.00 ea

1 - Not for 1983-84 with LH-jet

2 - Two relays on B23 (1983-84) LH-jet, one for main system and one for fuel pump.

3 - Not for 1988 and later 760 turbos or V6 models or 1991 SE models.

Bosch Fuel Injection and Engine Management

One of our favorite books when it comes to understanding fuel injection on Volvo models manufactured from 1970 to 1998. Packed with original Bosch diagrams and photos, this reference guide is considered required reading for anyone who is interested in understanding and working on the complex injection systems used in Volvo cars. Includes comprehensive coverage of theory and operation, troubleshooting, diagnosis, and test procedures with specifications and a large section on performance issues. Close to 200 pages.

Bosch fuel injection manual	**ML9L0019**	$30.01

Air Mass Meter

By Eric Mollerstuen

Symptoms:

An engine with a bad AMM (Air Mass Meter) may start and stall or be hard to start, it may hesitate under load, idle rough or run excessively rich or lean. The engine may also hiccup when you quickly step on the throttle.

Often, a dirty or faulty AMM will cause the engine to set a LEAN code and turn on the Check Engine Light. If the AMM sensor wire becomes dirty or is contaminated with oil (from a plugged flame-trap system), it will be slow to react to changes in airflow. This may cause the AMM to under-report airflow to the computer, causing the engine to run lean.

Not only will a faulty AMM cause the engine to run poorly, but it could also do some serious damage to the engine if left alone for too long. Often times when the sensor fails, it causes the engine to run lean which increases the temperature of the exhaust gases, which could damage the oxygen sensor, the catalytic convertor, the turbocharger and even the material inside the mufflers. On the other hand, sometimes the AMM failing will put the computer into a "Limp Home Mode" which will make the car run extremely rich. This can have a similar effect as a lean condition, but even more damaging. Starting in the engine itself, extra fuel can "wash down" the cylinder walls and essentially rinse the protective film of oil off of the walls which increases friction and can lead to piston ring damage. Once the unburnt fuel leaves the combustion chamber, it can ignite once it comes in contact with the super-hot turbocharger, increasing temperatures dramatically. This in turn can damage the oxygen sensor, as well as melt and plug up the core of the catalytic convertor, hampering performance and possibly damaging the turbo from too much backpressure.

Diagnosing:

Depending on which fuel system the car is operating on (LH 2.2, LH 2.4, LH 3.1), the engine computer may turn on the check engine light and store a fault code when the AMM fails. This can be very helpful, however there are several different fault codes that could indicate a bad sensor, some of which may be misleading.

- 1-2-1: Fault in signal to/from air mass meter.
- 2-2-1: Fuel system compensating for extremely rich or extremely lean air\ fuel mixture at cruise.
- 2-3-1: Fuel system compensating for rich or lean air\fuel mixture at cruise.
- 2-3-2: Fuel system compensating for rich or lean air\fuel mixture at idle.
- 3-2-2: Air mass meter hot wire burn-off function not working.

Some of these codes could indicate a faulty oxygen sensor, leaky or faulty fuel injectors or even a vacuum leak. So be careful not to assume the AMM right away.

If there are no fault codes stored, and the check engine light doesn't come on, there is a simple and pretty effective way of testing the function of the AMM. First start the car normally and allow it to warm up to operating temperature. Pay attention to how the car runs at idle, and how it responds when you step on the accelerator. Then shut the engine off and disconnect the wide electrical connector plugged into the AMM. On turbo cars, it is located between the air filter housing and the turbo inlet on the passenger side of the engine bay. On non-turbo cars, it is located between the air filter housing and the intake manifold on the drivers' side of the engine bay. With the plug disconnected, start the car and again pay attention to how the engine idles, and how it responds when the engine is revved up.

If there is very little change in the way the engine runs, or if the engine runs worse, then the sensor is probably not the problem. However if the engine seems to run better with the plug disconnected, then the AMM is most likely toast. In some cases where the sensor has completely failed, it is possible to unplug the connector which puts the engine in "Limp Home Mode" and will allow the car to be driven a short distance. Driving for very long in this mode though could do some damage to the engine such as discussed above.

Jectron Fuel Injection Cleaner

Formulated specifically with the K-jet/CIS injection in mind as used on the 1974-85 Volvos.

Cleans the fuel distributor and injectors to improve starting, idle, throttle response and mileage. Due to improved injection pattern and more precise control of the injected fuel quality, the engine burns cleaner and uses less fuel. At the same time, drivability is improved: easier starting, less stalling, smoother idling, better throttle response, no run-on after the ignition is shut off. Just add a can to a full tank of gas.

Fuel injection cleaner (K-jet) **MLLM2007** $7.52 ***SALE $6.77***

Fuel System Cleaner

Formulated for professional use to restore and keep the fuel system in good condition.

Reduces the CO and HC emissions and prepares the vehicle for a smog test. Successfully tested to international CEC standards. Can significantly improve: cold-start difficulties, rough idling, poor throttle response, loss of performance, lean surging, high exhaust emissions. Add a 500ml can to a full tank of gas to renew the fuel system.

Fuel system cleaner **MLLM2030** $20.02 ***SALE $18.00***

Oxygen Sensor Removal Tools

Replacing the oxygen sensor on your Volvo can be a real pain. Since it is installed directly in the head pipe or exhaust manifold, it will usually be severely rusted or corroded in place. The main sensor wires come right out of the center of the sensor, so it is not possible to use a standard socket over the sensor. Our oxygen sensor tools both have slots machined in them that allow you to slide them over the wires and onto the sensor for secure removal and installation. The oxygen sensor socket tool attaches to a 3/8" square drive so you can use a ratchet or extension to reach the sensor from farther away. Our new high leverage long handle oxygen sensor wrench has a flex-head joint and a bent handle which gives you several different positions to attack that hard to reach sensor.

Bosch oxygen sensor socket	**MLT88750**	$24.95
Oxygen Sensor Wrench	**MLT1023**	$22.95

Fuel Injectors and Seal Kits

A poor running car that otherwise has a good tune is sometimes hard to diagnose. Injectors will flow fuel for many years without wear but as the car gets over 200k miles it may be time to test them.

Use water to spray around the injectors to test for a bad injector seal. A momentary decrease in idle speed indicates that the seals are bad. A bad seal will cause a vacuum leak and will cause a lean condition. Replace the seals and reset the fuel mixture for best power and economy.

An engine that is rough at idle but clears up on acceleration may have a worn injector. On LH cars just disconnect the injector plug to find the injector that is not firing. Replacing it will smooth the idle and give more power on acceleration.

240 series	B20F	1975	**ML0437502003**	K-Jetronic injector, seals not included	$50.00 ea
A. 240 series	B21F, B21FT	1976-85	**ML0437502015**	K-Jetronic injector, seals not included	$54.71 ea
B. 240 series	B21F, B21FT	1976-85	**ML463864**	plastic injector holder/ insulator for K-Jet	$6.80 ea
240 series	B20	1975	**ML2D0200K**	fuel injector seal kit (K Jet.) all 8 seals	$16.00 kit
C. 240 series	B21, B21FT	1976-85	**ML2D0300K**	fuel injector seal kit (K Jet.) all 8 seals	$4.00 kit
D. 200, 700 series	B23, B230F/FT	1982-95	**ML2D0400K**	fuel injector seal kit (LH Jet.) all 8 seals	$19.95 kit
700 series	B230FT	1985-89	**ML0280150357**	LH Jetronic injector (seals included)	$185.00 ea

If you're unsure of what type of injectors you need, give us a call and we'll make sure you get the right ones for your Volvo. Injector seals aren't included except for LH injectors which include seals. Always replace injector seals when replacing an injector.

Sending Unit

Not sure how much fuel is in the tank? If your sending unit is original, that means that it's "reaching it's golden years.". The common "starting to fail" symptom is an inaccurate gauge that momentarily pegs at full. It might work like this for years - and it might not last another week. Put an end to uncertainty - prevent unwanted rest stops by the side of the road due to an empty tank - replace yours now!

200 series	1978-93	**ML1367253**	$228.39

Fuel Injection Test Light

Here's an inexpensive tester for do-it-yourselfers! Now you can check if individual injectors are getting the proper voltage. Easily plugs into the fuel injector connector. Just crank the engine while watching the light. If it flashes, your injector voltage is okay.

Bosch style fuel injection test light	**MLT3405***	$6.95

For use on cars with Bosch Electronic (LH) fuel injection (240 models (1982-93); all 700 and 900 models; and all models 1993 and newer.)

K-Jetronic Fuel Mixture Adjusting Tool

Now you can easily adjust the fuel mixture on your K-Jet equipped Volvo. Over time the fuel mixture can drift out of adjustment, causing a decrease in mileage performance and hard starting. With the proper manual you can set the mixture for optimum economy and performance. Be sure to check for vacuum leaks before making any adjustments (right for rich, left for lean).

200 series non turbo	1974-85	**MLT13256**	$4.50 ea
200 series turbo	1981-85	**MLT54630**	$4.00 ea

Anti-Friction Engine Treatment

When a customer tipped us on this product, we were admittedly skeptical. But after using it in a number of different cars, we thought it was great!

It forms a friction and wear reducing moly film on all internal moving surfaces of the engine. Engines can actually run smoother, quieter, cooler, and more reliably, with an extra measure of protection under extreme operating conditions and cold start situations. And it mixes with all motor oils, even modern synthetics.

It really does quiet down the engine and make it run smoother. Simply add one can to your engine each time you do an oil change for best results.

Anti-friction engine treatment	**MLLM2009**	$6.97	***SALE $6.27***

Ventil Sauber (Valve Cleaner)

This gasoline additive removes carbon deposits from valves and combustion chambers, especially important in the mid-1980s LH injection cars that had a high build up of carbon deposits on and around the valves. It also helps protect the fuel system against corrosion and icing. Ventil Sauber is suited for both injected and carbureted cars, and is safe for catalytic converters and turbocharged engines. Add a 300ml can to your full gas tank.

Valve cleaner	**MLLM2001**	$6.16	***SALE $5.54***

Magnetic Pickup Tool with LED Light

Flexible magnetic LED pickup tool is great for retrieving those dropped fasteners. Strong 4 lb. magnet and super bright LED provides the muscle and illumination to see into dark recessed areas to find fasteners that have slipped between fingers. Features non-slip rubberized handle, twist on/off switch for LED, and super flexible neck. 24 inch overall length.

Magnetic pickup tool with LED light	**MLT1010**	$9.95	***SALE $8.95***

Chilton Manuals

This shop manual for Volvo owners covers all models from 1970 to 1989 (1800, 140, 160, 240, 260, and 700 series.)

If you have a small fleet of Volvos and don't have manuals for them, this could be the guide for you. Also covers 200 and 700 series diesels and 1989, 700 series, overlooked by the major repair manual publishers. One inch thick and full of useful information.

All models	1970-89	**ML9L8786**	$23.96
200, 700, 900 series	1990-93	**ML9L8428**	$23.96

Haynes Repair & Service Manuals

Whether you need tune-up information, torque specs or step-by-step guidance through a complex repair, it's here in these "must have" reference works for the home mechanic. Haynes manuals have excellent photo sequences for assembling complex parts. They're a good value in our book!

240 series	1976-93	**ML9L0270**	$19.96	***SALE $17.96***
700 series	1983-88	**ML9L1550**	$19.96	***SALE $17.96***
740 series	1982-91 UK version	**ML9L1258**	$27.96	***SALE $25.16***
940 series	1990-95 UK version	**ML9L3249**	$27.96	***SALE $25.16***

The Bentley Bible

The Bentley has become our number one resource for helping customers with 200 series. You'll find a well-worn copy on everyone's desk in our customer service department. If you have a 240 or even a 260 of any vintage, you need this book.

Bentley is an official factory service manual publisher for Saab, Audi and Volkswagen and acknowledges Volvo Cars North America for the extensive use of original Volvo technical illustrations, which is a huge contributor to the quality and ease of use of this service manual.

240 series	1983-1993	**ML9L0293**	$39.95
240 series turbo models	1981-1985	**ML9L0293**	$39.95

Busted Knuckle Garage Fender Gripper/Protector

The Fender Gripper clings to painted material and holds tools at a near 90 degree angle, impervious to motor oil, coolant, lacquer thinner, brake fluid, etc. Made from strong PVC material reinforced with nylon mesh, soft and cushioned for protection with a non-slip finish the Fender Gripper is completely washable. An ounce of prevention is better than a pound of touch up paint. Dimensions: 22" X 34"

Fender gripper	**MLT53**		$19.95

Mechanics Pick Set

You can't appreciate how handy these tools are until you've had them around for awhile. For removing injector seals, oil seals, cam shims, retrieving small parts that have found their way into the depths of the engine compartment, fishing wires through the firewall, the list goes on...

The angled, hook, right angle and straight tips are removable to allow the tool to be used in tight spots. Knurled anodized aluminum handles and hardened steel tips provide years of service.

Pick set	**MLT80750**	$9.95 set	***SALE $8.95***

ipd Anti-Sway Bars

If you know ipd, you know that we began pioneering anti-sway bar set-ups for Volvos more than 40 years ago. Did you know we make anti-sway bar packages for other vehicles too? In some cases, the original manufacturer has copied our designs and integrated them into their own production line or we are providing them with our bars as original equipment. Think about that. Our bars were so superior to the original equipment that they BECAME original equipment.

Cars continue to evolve, and handling characteristics that were once available only on high-end exotics are now commonplace. We originally developed our anti-sway bars to enhance handling performance (which they do). However, these are the same sway bars many Volvo drivers install as safety improvements. They'll give your Volvo handling characteristics that put it in a handling class well above where it is now and get it well on its way to handling with the same panache as much sportier machinery while retaining its Volvo identity.

You won't believe the improvement and you'll wish you'd bought a set sooner. If you don't believe us, ask anyone who's tried them! Satisfaction Guaranteed, period. They really are that good. THE suspension performance part for any Volvo. Anti-Sway Bars have been ipd's best seller for over 40 years and represent the most significant return on investment of any product we sell. It's often remarked by customers and employees alike that "If you only buy one thing ever from ipd, it should be Anti-Sway Bars for your Volvo."

Anti-Sway Bars will drastically reduce the amount of body roll your car experiences around corners and increase ride comfort to boot. All this translates into much more precise handling and control over your Swede with absolutely zero trade-off in ride quality. All ipd safety anti-sway bar packages are built using the finest materials available, including, high memory 4140 cold-rolled chro-moly steel, lifetime warrantied polyurethane bushings and grommets and premium grade hardware. Detailed step-by-step instructions are included.

240 sedans	1977-93	25mm front, 22 mm rear	**ML6K5012**	$328.00
245 wagons	1979-93	25mm front, 22 mm rear	**ML6K5012**	$328.00
240 GT, Turbo & lowered	All	25mm front, 25 mm rear	**ML6K5014**	$348.00
700 sedans w/4 cylinder non-Turbo	1983-86	25mm front, 25 mm rear	**ML6K5025**	$328.00
700 sedans w/6 cylinder, non-Turbo	1983-87	25mm front, 25 mm rear	**ML6K5025**	$328.00
700 sedans w/ 4 cyl.	1987-93 (turbo '83-91)	25mm front, 25 mm rear	**ML6K5023**	$328.00
700 wagons	1983-87	25mm front, 25 mm rear	**ML6K5028**	$368.00
700 wagons w/ 4 cyl. & Turbo	1988-92	25mm front, 25 mm rear	**ML6K5024**	$368.00
940 sedans w/ 4 cyl. (not for SE models)	1991-95	25mm front, 25 mm rear	**ML6K5023**	$328.00
940 wagons w/ 4 cyl.	1991-95	25mm front, 25 mm rear	**ML6K5024**	$368.00
960 wagons	1992-94	25mm front, 25 mm rear	**ML6K5028**	$368.00

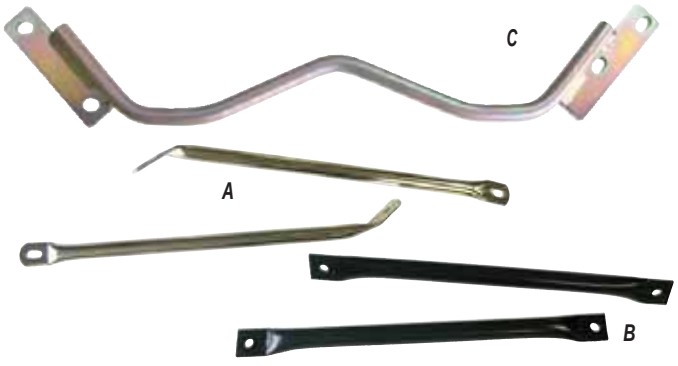
From: Matt in Albany, OR

This upgrade is the best thing you can do for your brick! These especially aided in my lowered 242 turbo. If your car is lowered, i would HIGHLY recommend getting the 25mm(1in) sway bars and Bilstein struts. There was a night and day difference in handling and much more confidence. GET UM!!!!

From: Sebastian in New York City

I installed the 25mm front and rear ipd swaybars "bigger is better" along with Koni yellow sport struts and shocks. This combination turned out to be the ultimate handling package for my non-turbo 1987 240DL. Literally, they have been a real life saver on three different road trips.

Factory Reproduction Chassis Braces



Volvo has offered chassis braces on some GT and European performance models in the past, and we have reproduced them for the budget-minded enthusiast. Simple firewall-to-strut housing braces and lower tie bars work to effectively reduce unwanted flex and improve handling response. Easy installation in about 30 minutes with common hand tools and included hardware and instructions.

A. 240, 260 series	1979-93	upper tie bars	**ML1240**	$69.95	***SALE $62.95***
B. 240 series	All	lower chassis tie bars	**ML1350**	$69.95	***SALE $62.95***
C. 700, 940 series	up to 1995	lower chassis brace	**ML6695**	$59.95	***SALE $53.95***

Truss Design Brace Kits by Cherry Turbo

Incredibly strong trussed and triangulated chassis brace kits for 240, 700 and 940 series Volvos. They are generally recognized by Volvo performance enthusiasts as the most effective at eliminating unwanted chassis flex. Constructed of cold rolled steel and powder coated for extremely high strength and a superior finish. For best results, you should install the upper and lower braces, as they are designed as a system.

A/B.	240 series	upper/lower kit	**MK2485** (1)(2)	$219.95	***SALE $197.95***
A.	240 series	upper brace	**MK2483** (1)	$169.95	***SALE $152.95***
B.	240 series	lower brace	**MK1353** (2)	$69.95	***SALE $62.95***
C/D.	700, 940 series	upper/lower kit	**MK7486**	$249.95	***SALE $224.95***
C.	700, 940 series	upper brace	**MK7483**	$169.95	***SALE $152.95***
D.	700, 940 series	lower brace	**MK6693**	$99.95	***SALE $89.95***

(1) The upper 240 brace will not fit on cars with the early "flat" style hood (1975-81).

Call for details or visit our website.

(2) Lower brace may require drilling.

1353 Reviewed by Tom Crowells from NE Portland

Great product. Use patience if you need to drill. It took less then 1 hr to install.

Its very important that you torque all the fasteners to 20lbft, or you'll have noises coming from under your feet. ;)

I am very happy with them, hard braking is met with less nose dive. I installed the upper CHASSIS (not strut tower) brace along with these and love the added stiffness to the chassis. Rough roads, speed bump, and driveway curbs feel have been all smoothed out by this upgrade. Aside from Turbo swaybars, my 245 has a fully stock suspension. Even is you're not going to all out performance, these are great for making any road easier to drive on. Road noise has been cut down alot too, due to the chassis not flexing with every bump or uneven surface.